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A3

Japanese Patent application Unexamined Publication No.H11-123350

[Scope of Claim]

[Claim 1] A fluid jet gun, comprising a nozzle formed of a flexible cylindrical body and a circular guide disposed concentrically outside the nozzle, the fluid jet gun allowing a liquid to pass through on an inner peripheral side of the nozzle to be jetted to thereby turn the nozzle along the guide,

characterized in that an annular part concentric with the nozzle is disposed so as to come into contact with the fluid jetted from the turning nozzle to direct the fluid inward.

[Claim 2] A fluid jet gun according to claim 1, characterized in that the guide is arranged to be slidable along a length direction of the nozzle so as to adjust a diameter of turn of the nozzle to result in a state allowing the fluid jetted from the nozzle to come into contact with the annular part and a state allowing the fluid to pass through on an inner side with respect to the annular part.

[Claim 3] A fluid jet gun according to claim 1 or 2, characterized in that a tubular member is provided which slopes so as to be disposed concentrically outside the guide with its portion on a front side located outward, and the annular member is disposed at a leading end of the tubular member.

[Detailed Description of the Invention]

[0001]

[Technical Field to which the Invention belongs]

The present invention relates to a fluid jet gun used in jetting gas, liquid, or a mixture of gas and liquid.

[0002]

[Prior Art]

A fluid jet gun is used in jetting a fluid such as, gas, liquid, or a mixture of gas and liquid. As such a fluid jet gun, one has been developed which is provided with a nozzle formed of a flexible cylindrical body and a circular guide disposed concentrically outside the nozzle and allows a liquid to pass through on the inner peripheral side of the nozzle to be jetted to thereby turn the nozzle along the guide. In this fluid jet gun, the high speed turning motion of the nozzle amplifies the pressure wave of the fluid and thus the fluid can be jetted with a stronger jet force.

[0003]

[Problem to be solved by the Invention]

Incidentally, since the above-mentioned fluid jet gun allows the nozzle to turn to amplify the jet force of the fluid, the fluid jetted from the nozzle as a whole is jetted in a form that gradually increases in diameter. Hence, for example, when an object for jetting has a wide area, the above-mentioned fluid jet gun is favorable. When an object for jetting has a small area, however, there has been a problem in that a large amount of liquid is jetted to miss the object for jetting and thus is wasted.

[0004]

Thus, an object of the present invention is to provide a fluid jet gun allowing a nozzle to turn along a guide which can jet a fluid without wasting it even when an object for jetting has a small area.

[0005]

[Means for solving the Problem]

In order to achieve the above-mentioned object, a fluid jet gun according to a first aspect of the present invention includes a nozzle formed of a flexible cylindrical body and a circular guide disposed concentrically outside the nozzle and allows a liquid to pass through on an inner peripheral side of the nozzle to be jetted to thereby turn the nozzle along the guide, and is characterized in that an annular part concentric with the nozzle is disposed so as to come into contact with the fluid jetted from the turning nozzle to direct the fluid inward. Thus, when the nozzle allows a fluid to be jetted while turning along the guide, the fluid thus jetted comes to contact with the annular member disposed concentrically with the nozzle, and thus is changed in direction by the annular member so as to direct inward.

[0006]

A fluid jet gun according to a second aspect of the present invention, in the first aspect of the invention, is characterized in that the guide is arranged to be slidable along a length direction of the nozzle so as to adjust a diameter of turn of the nozzle to

result in a state allowing the fluid jetted from the nozzle to come into contact with the annular part and a state allowing the fluid to pass through on an inner side with respect to the annular part. Thus, the guide is allowed to slide, whereby the diameter of turn of the nozzle is adjusted. When the nozzle is brought into the state allowing the fluid jetted from the nozzle to come into contact with the annular member, the fluid is changed in direction by the annular member so as to direct inward. On the other hand, when the nozzle is brought into the state allowing the fluid jetted from the nozzle to pass through on the inner side of the annular member, the direction of the fluid is not changed.

[0007]

A fluid jet gun according to a third aspect of the present invention, in the first and the second aspect of the invention, is characterized in that a tubular member is provided which slopes so as to be disposed concentrically outside the guide with its portion on a front side located outward, and the annular member is disposed at a leading end of the tubular member. Thus, the tubular member prevents a fluid from splashing back from an object for jetting and positions the annular part.

[0008]

[Embodiment of the Invention]

An embodiment of the present invention is described with reference to the figures as follows. As shown in FIG. 1, a fluid

jet gun 11 of this embodiment includes a nozzle 12, a guide member 13 disposed concentrically outside the nozzle 12, and an outer body 14 disposed concentrically outside the guide member 13.

[0009]

The nozzle 12 includes: a nozzle body 16 formed of a cylindrical body in which the whole body is formed integrally to have a substantially constant wall thickness with a flexible material such as, for example, nylon, polytetrafluoroethylene, polyurethane, or polypropylene; a weight part 17 provided on one end side of the nozzle body 16; and a support body 18 for supporting a portion on the opposite side to the weight part 17 of the nozzle body 16.

[0010]

The support body 18 has a substantially cylindrical shape and is provided with a connection part 26 that can be connected to a fluid supply source, which is not shown in the figure, on its opposite side to the side on which the nozzle body 16 is supported. The connection part 26 is connected to the fluid supply source, whereby the support body 18 allows a fluid supplied from the fluid supply source to be introduced on the inner peripheral side of the nozzle body 16. In addition, a flange part 27 is formed on a connection part 26 side of the support body 18. A wing bolt 28 for supporting the support body 18 in a manner allowing the support body 18 to be attached to and detached from the outer body 14 is screwed together with a portion on the outer peripheral side of the support body

18.

[0011]

The outer body 14 includes a cylindrical member 30 and a diameter-increasing tubular member (tubular member) 31 having a truncated conical shape with its diameter on one end side being equal to that of the cylindrical member 30 and its diameter on the other end side being larger than that of the cylindrical member 30. A portion on the above-mentioned one end side of the diameter-increasing tubular member 31 is concentrically jointed and fixed to the cylindrical member 30.

[0012]

The outer body 14 of this embodiment has a diameter-decreasing tubular member (an annular member) 32 having a truncated conical shape with its diameter on one end side being equal to that of the portion on the larger diameter side of the diameter-increasing tubular member 31 and its diameter on the other end side being slightly smaller than that on the above-mentioned one end side. The portion on the above-mentioned one end side of the diameter-decreasing tubular member 32 is concentrically jointed and fixed to a portion on the opposite side to the cylindrical member 30 of the diameter-increasing tubular member 31. In the outer body 14, at least the diameter-increasing tubular member 31 and the diameter-decreasing tubular member 32 are formed of a material with high transparency.

[0013]

As shown in FIG. 3, in the vicinity of the end portion on the opposite side to the diameter-increasing tubular member 31 of the cylindrical member 30 of the outer body 14 are formed a first guide groove 33 having a shape extending along the length direction and leading to the end portion and an engagement groove 34 slightly extending a little along the circumferential direction and leading to a midsection of the first guide groove 33. In addition, as shown in FIG. 1, a second guide groove 35 extending along the length direction is formed on the side closer to the center with respect to the first guide groove 33.

[0014]

The guide member 13 has a cylindrical member 37 and a diameter-increasing tubular member 38 having a truncated conical shape with its diameter on one end side being equal to that of the cylindrical member 37 and its diameter on the other end side being larger than that of the cylindrical member 37. A portion on the above-mentioned one end side of the diameter-increasing tubular member 38 is concentrically jointed and fixed to the cylindrical member 37. A plurality of annular slide bodies 39, 39 are fixed to the outer peripheral side of the cylindrical member 37 while being arranged in different positions in the length direction. With a portion on the outer peripheral side of the slide body 39 disposed on the side farther from the diameter-increasing tubular member

38 is screwed together a wing bolt 40 for fixing the slide body 39 to the outer body 14 and releasing the fixation thereof.

[0015]

In the guide member 13, the cylindrical member 37 is inserted from the opposite side to the diameter-increasing tubular member 38 into the inner peripheral side on the diameter-increasing tubular member 31 side of the cylindrical member 30 together with the slide bodies 39, 39 in the state that the wing bolt 40 is removed. In this state, the wing bolt 40 is screwed together with the slide body 39 in the state where the wing bolt 40 is inserted into and is passed through the second guide groove 35, and then is screwed thereinto. Thus, the wing bolt 40 holds the cylindrical member 30 to be sandwiched between the wing bolt 40 and the slide body 39, whereby the slide body 39, that is, the guide member 13 is fixed to the cylindrical member 30. Furthermore, when the wing bolt 40 is loosened, the guide member 13 can slide in the length direction with respect to the outer body 14 while the slide bodies 39, 39 are guided onto the inner peripheral face of the cylindrical member 30.

[0016]

Further, in the above-mentioned nozzle 12, the nozzle body 16 is inserted into the guide member 13 supported by the outer body 14 from the inner peripheral side on the opposite side to the diameter-increasing tubular member 38 of the cylindrical member

37. Then, as shown in FIG. 3(b), the support body 18 is fitted into the inner peripheral side on the opposite side to the diameter-increasing tubular member 31 of the cylindrical member 30 while the wing bolt 28 is moved inside the first guide groove 33. The flange part 27 is brought into contact with an end face 30a of the cylindrical member 30 and thus further fitting is limited. From this state, the support body 18 is rotated so as to move the wing bolt 28 in the circumferential direction of the cylindrical member 30, whereby the wing bolt 28 engages with the engagement groove 34 as shown in FIG. 3(a). In this state, the wing bolt 28 is screwed into the support body 18, whereby the wing bolt 28 holds the cylindrical member 30 to be sandwiched between the support body 18 and the wing bolt 28. Thus, the support body 18 or the nozzle 12 is fixed to the cylindrical member 30.

[0017]

In this engaged and fixed state, the leading end portion of the weight part 17 of the nozzle 12 in a linearly extending state is positioned in the vicinity of the end portion on the opposite side to the cylindrical member 30 of the diameter-increasing tubular member 31, and the diameter-decreasing tubular member 32 sloping to have its forward portion located inward is disposed concentrically with the nozzle 12. Furthermore, as shown in FIG. 1, in the state where the guide member 13 has been retreated maximally, the guide member 13 allows the portion of the nozzle 12 projecting from the

cylindrical member 37 to have a maximum length. On the other hand, as shown in FIG. 2, in the state where the guide member 13 has been moved forward maximally, the guide member 13 allows the portion of the nozzle 12 projecting from the cylindrical member 37 to have a minimum length.

[0018]

According to the fluid jet gun 11 with the configuration described above, when a fluid is passed through on the inner peripheral side of the nozzle 12 to be jetted, the nozzle is turned while being guided by a guide 37a located in the boundary part between the diameter-increasing tubular member 38 and the cylindrical member 37 having a circular shape of the guide member 13. Hence, as shown in FIG. 4(a), when the guide member 13 is brought into the state where it has been retreated maximally with respect to the nozzle 12, the projecting portion of the nozzle 12 comes to have a maximum length, resulting in maximization of the radius of turn of the jetting port, which is not shown in the figure, at the leading end. At this time, the diameter-decreasing tubular member 32 fixed to the leading end of the outer body 14 is located in a place allowing the diameter-decreasing tubular member 32 to come into contact with the fluid jetted from the turning nozzle 12. Hence, as indicated with the alternate long and short dash line in FIG. 4(a), the fluid jetted from the turning nozzle 12 in a form that gradually increases in diameter is changed in direction through the contact with the

diameter-decreasing tubular member 32 so as to direct inward, in other words, so as to be jetted in a form that gradually increases in diameter, and finally the fluid is brought into focus. Hence, a fluid can be jetted without being wasted even when an object for jetting has a small area.

[0019]

Furthermore, as shown in FIG. 4(b), when the guide member 13 is brought into the state where it is moved forward maximally, the projecting portion of the nozzle 12 comes to have a minimum length, resulting in minimization of the radius of turn of the jetting port that is not shown in the figure. At this time, the diameter-decreasing tubular member 32 fixed to the leading end of the outer body 14 is located in a place allowing the fluid jetted from the turning nozzle 12 to pass through an opening portion 32a inside the diameter-decreasing tubular member 32 without coming into contact therewith. Hence, the fluid jetted from the turning nozzle 12 in a form that gradually increases in diameter is jetted without being changed in direction as indicated with the alternate long and short dash line in FIG. 4(b). Hence, a fluid also can be jetted favorably in the case where an object for jetting has a wide area. When the position of the guide member 13 is changed in a forward direction in a range in which the fluid jetted from the nozzle 12 does not come into contact with the diameter-decreasing tubular member 32, the radius of turn of the nozzle 12 can be changed and

thus the jetting diameter of the fluid jetted from the nozzle 12 can be changed.

[0020]

Here, the configuration is employed in which the diameter-decreasing tubular member 32 is supported by the leading end of the diameter-increasing tubular member 31 for preventing a fluid from splashing back from an object for jetting. Hence, the diameter-increasing tubular member 31 prevents a fluid from splashing back from an object for jetting and supports the diameter-increasing tubular member 32. Thus, the number of parts and cost can be reduced as compared to the case where the member for preventing a fluid from splashing back from an object for jetting and a member for supporting the diameter-decreasing tubular member 32 are provided separately. The diameter-decreasing tubular member 32 may be any member as long as it can direct a fluid inward. Hence, it may be replaced by, for example, a simple cylindrical member with a constant diameter.

[0021]

[Effect of the Invention]

As described above in detail, according to the fluid jet gun described in claim 1 of the present invention, when the nozzle allows a fluid to be jetted while turning along the guide, the fluid thus jetted comes to contact with the annular member disposed concentrically with the nozzle, and thus is changed in direction

by the annular member so as to direct inward. Hence, the fluid can be jetted without being wasted even when an object for jetting has a small area.

[0022]

According to the fluid jet gun described in claim 2 of the present invention, the guide is allowed to slide, whereby the diameter of turn of the nozzle is adjusted. When the nozzle is brought into the state allowing the fluid jetted from the nozzle to come into contact with the annular member, the fluid is changed in direction by the annular member so as to direct inward. On the other hand, when the nozzle is brought into the state allowing the fluid jetted from the nozzle to pass through on the inner side of the annular member, the direction of the fluid is not changed. Hence, the fluid can be jetted without being wasted even when an object for jetting has a small area, and the fluid also can be jetted favorably in the case where an object for jetting has a wide area.

[0023]

According to the fluid jet gun described in claim 3 of the present invention, the tubular member prevents a fluid from splashing back from an object for jetting and positions the annular part. Hence, the number of parts and cost can be reduced as compared to the case where the member for preventing a fluid from splashing back from an object for jetting and a member for positioning the annular part are provided separately.

[Brief Description of the Drawings]

[FIG. 1] A sectional side view showing an embodiment of a fluid jet gun of the present invention, illustrating a state where a guide member has been retreated maximally.

[FIG. 2] A sectional side view showing the embodiment of a fluid jet gun of the present invention, illustrating a state where the guide member has been moved forward maximally.

[FIG. 3] Sectional side views illustrating the embodiment of a fluid jet gun of the present invention: FIG. 3(a) shows a state where a nozzle is attached to an outer body; and FIG. 3(b) shows a state where the nozzle is removed from the outer body.

[FIG. 4] Partial sectional side views illustrating the embodiment of a fluid jet gun of the present invention: FIG. 4(a) shows the state where the guide member has been retreated maximally; and FIG. 4(b) shows the state where the guide member has been moved forward maximally.

[Description of Symbols]

11 fluid jet gun

12 nozzle

13 guide member

31 diameter-increasing tubular member (tubular member)

32 diameter-decreasing tubular member (annular member)

37a guide

２から噴出させられる流体が縮径筒状部材３２に接触しない範囲内において変更すれば、ノズル１２の旋回半径を変更し噴出させられる流体の噴出径を変更することができる。

【００２０】ここで、流体の噴出対象からの跳ね返りを防止する拡径筒状部材３１の先端に縮径筒状部材３２を支持させる構造であるため、拡径筒状部材３１が流体の噴出対象からの跳ね返りを防止しかつ拡径筒状部材３２を支持する。したがって、流体の噴出対象からの跳ね返りを防止する部材と縮径筒状部材３２を支持する部材とを別々に設ける場合に比して部品点数およびコストを低減することができる。なお、縮径筒状部材３２は、流体を内方に向けるものであればよく、例えば径が変らない単なる円筒部材に変更してもよい。

【００２１】

【発明の効果】以上詳述したように、本発明の請求項１記載の流体噴出ガンによれば、ノズルがガイドに沿って旋回しつつ流体を噴出させると、噴出させられた流体が、ノズルと同心状をなす環状部材に接触し該環状部材で方向が内方に向くよう変えられる。したがって、噴出対象が狭い範囲である場合にも無駄なく流体を噴出させることができる。

【００２２】本発明の請求項２記載の流体噴出ガンによれば、ガイドをスライドさせることによりノズルの旋回径を調整し、ノズルから噴出させられる流体を環状部材に接触させる状態とすれば流体が環状部材で方向が内方に向くよう変えられ、また、ノズルから噴出させられる流体を環状部材の内側に通過させる状態とすれば流体の方向が変えられることがない。したがって、噴出対象が狭い範囲である場合にも無駄なく流体を噴出させることができ、かつ、噴出対象が広範囲である場合にも良好に流体を噴出させることができる。

【００２３】本発明の請求項３記載の流体噴出ガンによれば、筒状部材が流体の噴出対象からの跳ね返りを防止しかつ環状部を配置する。したがって、流体の噴出対象からの跳ね返りを防止する部材と環状部を配置する部材とを別々に設ける場合に比して部品点数およびコストを低減することができる。

【図面の簡単な説明】

【図１】　本発明の流体噴出ガンの一の実施の形態を示す側断面図であって、ガイド部材が最も後退した状態を示すものである。

【図２】　本発明の流体噴出ガンの一の実施の形態を示す側断面図であって、ガイド部材が最も前進した状態を示すものである。

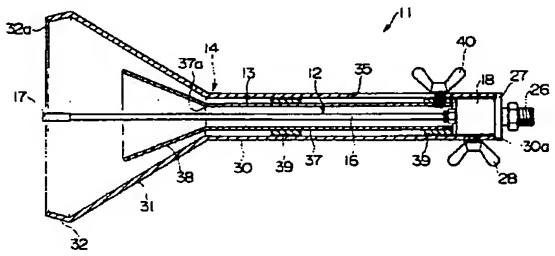
【図３】　本発明の流体噴出ガンの一の実施の形態を示す側面図であって、（ａ）は外体にノズルが取り付けられた状態を、（ｂ）は外体からノズルが取り外された状態をそれぞれ示している。

【図４】　本発明の流体噴出ガンの一の実施の形態を示す部分側断面図であって、（ａ）はガイド部材が最も後退した状態を、（ｂ）はガイド部材が最も前進した状態をそれぞれ示している。

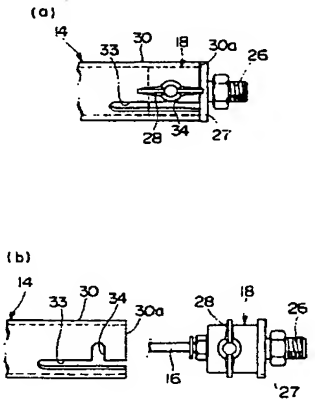
【符号の説明】

１１　流体噴出ガン
１２　ノズル
１３　ガイド部材
３１　拡径筒状部材（筒状部材）
３２　縮径筒状部材（環状部）
３７ａ　ガイド

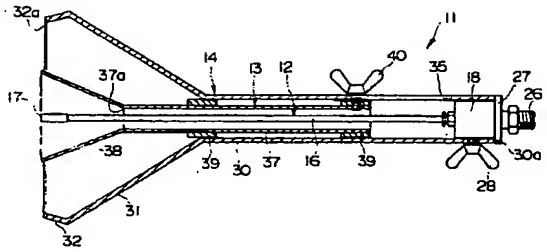
【図１】



【図３】



【図２】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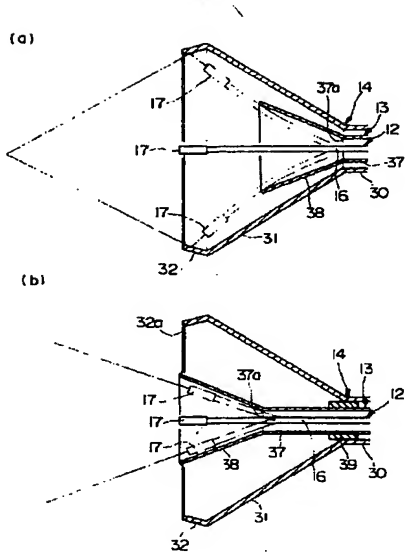
32

【図４】


(a)
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(b)
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